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in importance. Chinese authorities of the VIIth–IXth centuries, and Arab geographers of the Xth century, give us the names of many towns and settlements in the Talash and Chu country. The scholar Jemal-ul-Karshi tells us the names of many scholars of his own time who lived in the towns on the lower Sir Darya, and reports on their service to science. Among the MSS. in the libraries of Istanbul there are many religious and literary works of this Mongol period — unfortunately not so far examined. If the Amu Darya were to flow once more into the Caspian, and the lower parts of the Chu, which now sink into the sands, could be made useful for sowing, then in some future Turkistan there might be a revival of the lower Sir Darya, the Özboy, the lower Talash and Chu, and Urgench, Akmechit and Tokmak become once more administrative and cultural centres.

At first sight it is not apparent how a diversion in the lower course of the Amu Darya could affect the prosperity of the upper piedmontane tracts watered by the Ili, Chu and Talash rivers. But separate passages [1] indicate that the writer is seeing a vision of some kind of triple canal project as worked out in the Panjab. He has in view the weaving together of a network of rivers and link canals, leading the Chu and Lake Balkhash through the Betpak Dala to reinforce the Sir Darya, the Sir Darya into the Amu Darya, and the combined rivers into the Caspian Sea.

It is clear from Schuyler [2] that the early Russian engineers were of the same mind. According to him, the theory was based originally on surveys made by an early Tsarist officer, Colonel Tchaikovsky. Schuyler makes two observations, first that the Özboy is in line with the Yeni Darya, and secondly that there is indubitable evidence to the level of Issik Köl having once been several hundred feet higher than it was when he visited the country. It could then have acted as a reservoir at the source of the Chu River. This evidence was held to support a proposition that the volume of water in the Chu might have been so increased as to discharge into the Sir Darya, and thence in line into the Yeni Darya, so forcing the Amu into the Özboy bed and towards the Caspian

[1] *Op. cit.* pp. 21 and 580 *et seqq.*

[2] *Op. cit.* i, 50 *et seqq.*

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185 Sea. The subsequent depression of Issik Köl greatly reduced
123 the volume of the Chu, with the result that the rapid current in the Sir Darya, no longer turned by a river coming from the east, impinged upon the opposite bank, creating swamps and finally struggling through them along the level steppe until it emptied as at present into the northern end of the Aral Sea. In the same way the Amu Darya, forming marshes about the places where it formerly turned into the Özboy, found a new outlet at the southern end of the Aral Sea.

Togan's idea is that, by another change to be engineered by man, the economic future of his Türkili could be assured. We shall see that Soviet engineers have put forward a great engineering project for diverting the Amu Darya to the Caspian to irrigate the Karakum, and the natural deduction from this would be that they believe water did once reach the Turkmen desert from the river. But the latest Soviet theory seems to be that the Oxus has not changed its course since the Tertiary Period, when it was turned to the Aral by an earth movement along the axis of the Caucasus uplift.[1] In this view, which is at variance with many records, Soviet savants are unlikely to be relying on what others have said. It is more credible, I think, that they are upheld by the dogma that it is left to Soviet man alone to change the face of nature. The Tertiary Period is safe enough; but historical convulsions are a different matter. They cannot be admitted to have occurred if they in any way detract from the inevitable movement of a Five-Year Plan. When it comes to history, it must be Soviet man who is the first to put things straight.

175 There were, however, reasons for the decline of Turkistan from its position held in the Middle Ages other than changes in the course of the rivers. Although these reasons are historical, they are of a general nature, and since they are connected with the use by man of geographical sea-routes in preference to land-routes as the medium of commerce, it is

[1] Bib. II, 1, Professor J. Bernal.

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433 are situated the largest copper-workings and smelting plants
328 in the Union, and there is another at Almalik close to Tashkent and therefore better placed for transport than the larger mines farther north. At Chimkent is the largest lead centre in the Union, working ore from many quarters, including the Tajik hills. And there are important minerals, said to include mercury, radium and uranium, in the mountains surrounding
433 the Farghana Valley. But, apart from the man-power they can supply to feed the industrial Moloch, the main importance of the five republics in this field is to be found in the production of the raw material for textiles — cotton and silk — and the availability of supplementary sources of power, which include oil, coal and water-generated electricity. The production of the last, hydro-electric power, is tied up in the minds of Soviet engineers with large-scale irrigation, and this in turn with transport, both by waterway and railway. In all these spheres there has been ambitious planning, and forecasts are often extravagant and even grandiose. In almost all cases it is hard to disentangle prospective targets from actual results, publicity media being regularly used to give an impression that projects which have not in fact left the draughtsman's table are on the point of realization in the field. Indeed it can fairly be said that almost any account of planned development in Soviet Russia, industrial or agricultural, calls for question on this ground. Usually the more poetic the vision of the publicist, the less advanced will be found to be the execution of the work. Another tendency is to claim as the triumph of the Soviet genius works which were in fact conceived and carried to an advanced stage by Tsarist engineers. This is particularly apparent in the field of railway works.

●185 It is convenient to view industrial development in this region under four main heads:

(*a*) power, including oil, coal and hydro-electric;
(*b*) light industry, mainly cotton and silk textiles;
(*c*) irrigation;
(*d*) transport, railway and waterway.

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185 These four overlap, as for instance in the case of irrigation and hydro-electric works, or irrigation and navigation canals, both of which Russian engineers like to set side by side. They do not by any means give an exhaustive analysis — the copper and lead mines and works above mentioned are instances of this — and at many points they have to be considered in relation to agricultural development also. But they do provide some general idea of the all-over Soviet plan for the development of Turkistan. In broad terms this may be said to be to continue the Tsarist policy of using Central Asian products to make Russia self-sufficient in the raw materials of the finer textiles (cotton and silk); to improve on that by bringing the mills to the fields in order to manufacture on the spot; largely to increase the area under cash-crops by irrigation; to use the irrigation canals to aid in the supply of power; to increase also to the limit the fuel sources of power available within these territories; and finally to provide the rail transportation necessary for bringing the whole agricultural and industrial complex within the all-Union economic system.[1]

496 I mention transportation by rail last because the Soviet record in the matter of railway construction has been remarkably unimpressive, and one has the impression that the provision of enough and efficient transportation links does not precede or synchronize with, but follows, developments in other fields, seriously handicapping the prospect of a balanced economy. Only one really important trunk railway is known to have been fully completed in Turkistan during the thirty-five years of the Soviet era, and that is the Turk-Sib. Even that was planned and surveyed under the Tsars, and but for the Revolution would almost certainly have been put through much earlier than 1930, which was the year in which the Soviets with a great fanfare announced its eventual completion. The Tsarist engineers completed the Trans-Caspian (or Central Asian) Railway in the eighties of last century and the

[1] A table of a few targets set under the fourth Five-Year Plan which ended in 1950 follows this chapter. The targets for the most part are said to have been reached, and the Soviets have now moved on to a fifth Plan. For rail-network see map opposite.

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Since the war Caroe has been planning on a far grander
653 scale. The first two schemes which follow may be called
812 'local' in the sense that, in appearance at least, they are not
185 part of a continental linked project dealing in the waters of more than one river. These two projects are:

(i) *The Karakum Canal*

The project was an old one, but it was revived in 1945, and ratified in 1947. The main channel is to be some 350 miles long and to irrigate nearly half a million acres. The headworks were to be somewhere near Kerki on the Oxus left bank, and the main objective is to increase the cultivated area watered by the Murghab and Tejen rivers in the Merv and Serakhs oases. Work was stated to have been started in 1949.

A work of this kind, skirting the Kopet Dagh line of mountains which forms the Persian frontier, must cross the natural drainage lines of the country, and involve heavy bridging or siphoning and much danger of being breached by floods, to say nothing of being choked by sand-drifts. Without any local knowledge it is possible to affirm that this canal must take time to construct and will be expensive to maintain. Confidence in the Soviet engineers is not increased by loose talk that the canal will be used for shipping. Navigation and irrigation are ill partners.

(ii) *The Uzbek, or Upper Oxus, Canal*

This project was planned by the Uzbek Academy of Sciences in May 1947. It is a very large scheme for a canal 500 miles long to supplement the irrigation at the tail of the Kashka Darya and the Zarafshan systems — among the best cotton-lands in Central Asia — by water from the Oxus. The project was described at some length by a spokesman of the Central USSR Ministry of Agriculture. The plan envisages the construction of a headworks at Kelif on the Oxus right bank, where the river finally emerges from the hills into the plain. At this point the right bank rests on a spur of the Hissar Range, a rocky eminence which canalizes the channel

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and prevents it from shifting as it is always doing in its course through the plains lower down. On the face of it then the site is well chosen for the headworks of a perennial canal. At this point a dam described as 6 km. long and 20 metres high was to be constructed. For the next 100 km. the main canal would run along the skirt of the Hissar Range, passing on its way a point named Akyar where it would drop 34 metres, the fall being used to establish a hydro-electric power station. The canal would then swing northward to cross the Kaskha and Zarafshan rivers and augment the water-supply in both. The forecast spoke of opening up new irrigation to the extent of 1·2 million hectares, or nearly 3 million acres, and the estimated cost was 7000 million roubles. No date of completion was named.

This project, like the last, involves cutting across the natural drainage lines of the country, and the upper part of the main channel, skirting the great chain of the Hissar mountains (rising at one point to over 15,000 feet) will necessarily have to withstand occasional floods of extreme violence. Further, the crossing of the Kashka and Zarafshan basins at a point presumably not far distant from the debouchment of those rivers into the plains will demand engineering and constructional skill of no mean order.

The plan calls for the establishment on the falls of hydro-electric generating stations of an aggregate capacity of 1 million kilowatts, equal to about ten times that of the Ardnacrusha Station on the Shannon.

The spokesman said that these two canals together were expected to take nearly 2000 cubic metres per second [1] from the Amu Darya. On the assumption that each is designed to take 1000 cubic metres, each of these canals would be about twice as large as any of the great works constructed in the Panjab. This 2000 cubic metres volume is quoted as taking about half the total discharge of the river even in July and

[1] To convert cubic metres into the normal British engineer's standard of water-volume, viz., cubic feet per second, an adequate rule of thumb is to multiply by thirty. 1000 c.m.s. would therefore be equivalent to about 30,000 'cusecs'.

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August, the flood months owing to summer melting of snow in Oxus' 'high mountain cradle in Pamere'. A draught on the river of this order must of course put in jeopardy the irrigation down-stream in the Khorezm area, but the spokesman met this by explaining that three reservoirs were to be constructed to store 6000 million cubic metres in the seasons of low demand.

These two projects for irrigation from the Oxus, great as they are, pale into insignificance when set against an immense integrated plan, described as 300 times the size of the T.V.A.[1], for the application of the latest sciences to the Dnieper, Don, Volga and Amu Darya basins in the connected fields of irrigation, navigation, hydro-electric power and afforestation. Here we are concerned with the Amu Darya only, but the plans announced cover much the same ground on the European rivers. Over the whole field the planners speak in terms of transforming an area of two million square miles, two-thirds the size of the United States. The rivers are to be dammed at a number of points, the dams forming reservoirs many miles across; power stations of great capacity are to be established at these barrages with irrigation canals taking off at the same points; ocean-going steamers are seen as penetrating to the lakes through locks; and finally belts of forest, three miles wide (quite modest this), are to be planted in the valleys 'to keep them damp and on the watersheds to let the run-off from melting snows down gently'. In the Karakum, an awkward place for labour, the forests are to be sown with seed broadcast from aircraft. Finally, the suggestion is that, to avoid a fall in the Caspian Sea following the diversion of rivers to irrigation, waters flowing to the Arctic are to be impounded to compensate the southern rivers. A presumably serious commentator[1A] has written that it is possible that ultimately no water from Siberia will go to the Arctic, and it has even been suggested that the consequent greater salinity of the Arctic Ocean may reduce the size of the Polar ice-cap.

[1] Tennessee Valley Authority.

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Turning more particularly to that part of the scheme to be derived from the waters of the Amu Darya, to be called the Turkmenian Canal, the same commentator [1A] stated:

> The scientists told me a great deal about how they had planned the scheme for the Karakum desert. . . . They are chosen to cover the whole range of interests . . . there are hydrologists, navigation experts, electrical experts, every kind of engineer, soil scientists, zoologists, botanists, geologists, there are also geo-physicists and seismologists . . . besides all these there are the archaeologists, who are considered a very important part of the scheme.

In the presence of this battalion of experts from Academies of Sciences, with some conflict of interest (one would think) even in Russia, the genie of the scheme will surely sigh for one good practical engineer.

The Turkmenian Canal itself was announced in September 1950 in a decree of the Central Council of Ministers of the USSR. It is nothing short of an attempt to realize the old dream for the redirection of the Oxus back into its ancient course to the Caspian Sea by means of a canal 700 miles long starting from Takhya Tash on the left bank close to Nukus, skirting the Sarikamish depression (which, being even deeper than the Caspian, would take too long to fill up), and thence along the old bed of the Özboy across the middle Karakum and through the Balkhan gap into the sea near Krasnovodsk.[1] It is not unamusing to reflect that this also was an idea in the minds of Tsarist engineers more than fifty years ago. Curzon, writing in 1889, mentions that as a navigation project it had even occurred to the fertile mind of Peter the Great, and quotes the scornful saying of the German engineer Kiefert referring to the project, when at the height of its favour in the seventies of last century, as the great Central Asian sea-serpent. But it seems clear that a decision has now been taken for a canal to irrigate 1,300,000 hectares or about 3,000,000 acres, and to carry three hydro-electric generating stations, each with a capacity of 100,000 kilowatts (each about equivalent to the Shannon Station in Ireland). Work was to begin in

[1A] Professor J. Bernal, F.R.S., Bib. II, 1.

[1] [See cat. 116, pp. 23-26 - Analyst]

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1951 and is scheduled for completion in 1957. The official spokesman [1] stated:

> The idea of bringing life to the desert by turning the course of the Amu Darya towards the Caspian Sea originated long ago. Yet Tsarist Russia was incapable of carrying it out. It was on the initiative of Stalin that the Government decision was taken to revive the desert and fulfil the age-old dreams of the people of Central Asia. The special characteristic of the present scheme is that the waters will be used in their entirety for irrigation and will not be discharged into the Caspian Sea as proposed in all preceding projects. All remaining canals of the world, including those of America, Egypt and India, are considerably shorter. . . . Krasnovodsk will receive an abundant supply of water [is this inconsistent with the special characteristic?]. The new irrigation construction is an important link in the great Stalin plan for the transformation of nature. The Caspian desert plain will soon be converted into a marvellous flourishing land.

The project is linked with the railway constructional plan already mentioned for a line northward from Charjui to Kungrad along the Oxus left bank, that described as one of the great railway building feats of all time.[2]

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In face of the admissions of short supply in the river which will follow the completion of the first two Amu Darya projects above mentioned, it is not easy to see how the Takhya Tash headworks — down-stream of Kelif and Kerki — would find sufficient volume to irrigate the whole of the Karakum from Khorezm to the Caspian. Can it be that this grandiose project for restoring the prosperity of the days before 1573, the year when the Oxus turned to the Aral Sea, is alternative and not supplementary to the Karakum project? It is possible that the surveys may have convinced the Soviet engineers of the difficulties of constructing a canal along the skirts of the Kopet Dagh, with all the dangers of breaching by flood, and induced them to have second thoughts. It is not inconceivable that they, or their political superiors, may have been influenced by the romance which appeals so greatly to the local bourgeois patriots, that of turning the Oxus back

[1] Deputy Minister, Cotton Cultivation USSR.

[2] Bib. II, 10.

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has been erected and the longest derivation canal in the Union has been excavated. Work was begun in 1943, and the station is supposed to have started to operate in 1948. The capacity is stated to be 200,000 kilowatts. The next largest is on the Chirchik and Boz-Sir, near Tashkent, where there is a series of linked stations, six of them finished in 1945 and four more in 1947. Others are planned. The capacity stated is 150,000 kilowatts. There is also planning for the construction of a series of generating stations on canal falls on the Upper Oxus–Zarafshan project, to reach an aggregate capacity of 1,000,000 kilowatts, and for three similar stations of an aggregate capacity of 100,000 kilowatts, also on canal falls on the great project for a Turkmenian Canal along the old Amu-Darya bed of the Özboy. There are, moreover, numerous small power stations, listed in hundreds, on mountain torrents and streams, and also on canal falls in Farghana and elsewhere in the piedmontane area. The largest recently mentioned seem to be in Tajikistan on the Varzob and Vakhsh rivers, 13,000 and 10,000 kilowatts respectively.

The impression derived is that the Soviet engineers have two techniques: the first for the establishment of large stations at canal headworks or on canal falls, and the second for the dispersal of large numbers of small local plants on mountain torrents.

Now, on a general view, the terrain of Turkistan should be admirably suited for the harnessing of water-power in the east where the mountains merge into the plains. But it is unlikely to be so favourable well out in the plains, where the declivity is very small in the direction of the Caspian and Aral Seas. Canal falls do not normally provide good sites for large stations, the fall being insufficient except in favourable circumstances. The plains of Turkistan are flatter than central Ireland. It may be that the great volume of the Turkistan rivers will make up for any insufficient fall. The discharge of the Oxus in flood may be anything up to 10,000 cubic metres a second, but water for a generating plant must be canalized in a derivation channel. Some scepticism is

1950 TARGETS[1]

	Population 1939		Heavy Industry (Millions of Tons)			Textiles (Millions of Metres)			Crops (Millions of Hectares *)	
	Total	'Native'	Coal	Oil	Steel	Cotton	Silk	Woollen	Cash	Grain
Kazakistan	6,146,000	3·09	16·4 (Karaganda)	1·2 † (Emba)	0·07	19·0	Nil	2·9	0·34	5·34
Kirghizia	1,459,000	0·88	1·6	0·08	Nil	0·7	0·92	0·5	0·11	0·7
Tajikistan	1,485,000	1·22	0·44	0·06	Nil	18·0	5·1	Nil	0·18	0·63
Turkmenia	1,254,000	0·83	0·06	1·1 (Nebit Dagh)	Nil	22·0	0·83	0·82	0·16	0·16
Uzbekistan	6,282,000	4·98	1·1 (Angren)	1·1	0·1	161·0	14·0 (Samarkand and Margilan)	Nil	1·13	1·38
Total	16,626,000	11·00	19·6 =7·8% of USSR total of 250 m. tons	3·54 =9·9% of USSR total of 35·4 m. tons	0·17 USSR total given as 25 m. tons	220·7 =4·7% of USSR total of 4·686 m. metres	20·85 USSR total not ascertained	4·22 USSR total not ascertained	1·92 of which 1·35 m. is under cotton = 80·4% of USSR total	8·21 =7·7% of USSR total of 105·8 m. hectares

* 1 hectare = 2·5 acres approx.

† Does not include Ural oilfields at Ishimbay, producing in 1950 at the rate of, say, 7 million tons a year.

1 [i.e. of Fourth Five Year Plan -- Analyst]

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